Fostering Explainable Online Review Assessment Through Computational Argumentation

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Online product reviews are useful but heterogeneous

★, ★, ★, ★	They're always well built and last me quite a few years. The only downside is they tend to be a bit pricey.
★	My shoes are damaged and it is a warranty period then also the team has no response. Don't buy this product, very expensive.
★, ★, ★, ★	Largely my fault for not reading carefully, but it is very uncomfortable

[*]

- How can we aggregate these reviews to get an overall sense of the product?
- Which of the reviews can we trust?
- What are the strengths and weaknesses of the product?
- Two reviews conflict regarding the quality of the product!
  - a_1 : 'They're well built...'
  - a_2 : 'It is damaged in it is warranty...'.
- How can we deal with **inconsistency**?
- **Objective**: Developing a transparent and explainable approach to online review assessment that leverages the power of **formal argumentation**.[2]

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*https://www.freepik.com/free-vector/diverse-wondering-people-with-question-marks_27472825.htm#query=cartoon

Abstract Argumentation to Assess Product Reviews

We use **Abstract Argumentation Frameworks** to address different opinions and points of view in product reviews.
An *Abstract Argumentation Framework* [1] is a pair (A, R), where A is a set of arguments, and $R \subseteq A \times A$ is a binary attack relation between arguments. We follow the following steps to achieve this goal:

$Review\_Set = \{r_i\}$

↓

Identify Abstract Arguments
$A = \{a_i \mid r_i \text{is a review}\}$

↓

Weigh Arguments
$w(a_i) \cong quality(r_i) \times importance(a_i)$

↓

Identify Argument Relations
$R = \{(a_i, a_j) \mid a_i, a_j \in A \wedge w(a_i) > w(a_j)\}$

↓

Construct $F = (A, R)$

↓

Compute Grounded Semantics of F

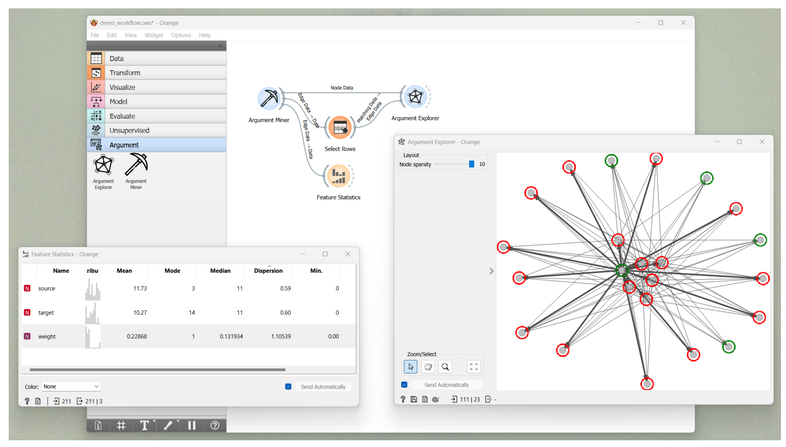
- $a \in A$ is *defended* by $S \subseteq A$ if $\forall c \in A$: if $(c, a) \in R$, $\exists b \in S$ s.t. $(b, c) \in R$
- $\Gamma_F(S) = \{a \in A \mid a$ is defended by $S \wedge \nexists$a, b$\in S$ s.t. $(a, b) \in R\}$
- S is the grounded extension in F if S is the $\subseteq$-least fixed point of $\Gamma_F(S)$

↓

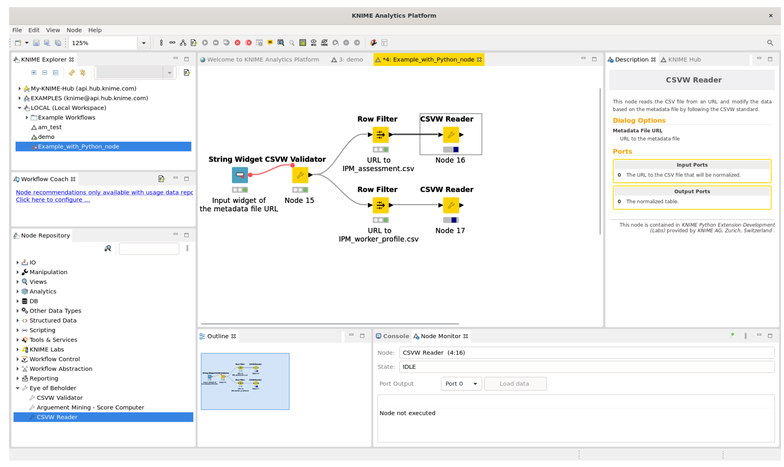
$Review\_Set$ ✓

Transparent Pipelines for Abstract Argumentation

To facilitate the implementation, tuning, and analysis of the resulting Argumentation Frameworks, we are currently implementing transparent pipelines.



Pipeline Implementation in Orange (`https://orangedatamining.com/`).



Pipeline Implementation in KNIME (`https://knime.com/`).

Check `https://github.com/EyeofBeholder-NLeSC` for details.

References

[1] P. M. Dung. On the acceptability of arguments and its fundamental role in nonmonotonic reasoning, logic programming and n-person games. *Artificial Intelligence*, 1995.

[2] A. K. Zafarghandi and D. Ceolin. Fostering explainable online review assessment through computational argumentation. 2022.